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10/578,786	05/09/2006	Euan Christopher Smith	1365.107US1	8696

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EXAMINER	
STONE, ROBERT M	
ART UNIT	**PAPER NUMBER**
2629	

NOTIFICATION DATE	DELIVERY MODE
10/13/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/578,786	SMITH ET AL.	
	Examiner	**Art Unit**	
	ROBERT STONE	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-7,15-18,22-24,26,27 and 30-36* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *30* is/are allowed.

7)☒ Claim(s) *1-7,15,22-24,26,27 and 31-36* is/are rejected.

8)☒ Claim(s) *16-18* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5 February 2010 has been entered.

Response to Amendment

2. The amendment filed on 5 February 2010 has been entered and considered by the examiner.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-6, 15, 23-24, 26-27, 31, 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Yamano* (US 2004/0066363) in view of *Smaragdis* (US 2005/0021333).

As to **claim 1**, *Yamano* discloses a method of driving an organic light emitting diode display (method applied to numerous types of displays including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the method comprising:

receiving image data for display (receives input image data for driving the display [0012,0204,0628,0633,0638]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix “correspond” to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix

defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

driving said display row and column electrodes using said row and column drive signals respectively defined by said first and second factor matrices (display shown in Figs. 16, 26, 27, 31, 35, and 39-43 are being driven according to display matrices of Figs. 8-15).

Yamano does not expressly disclose wherein said factorising comprises non-negative matrix factorisation (NMF).

Smaragdis discloses factorizing image data using non-negative matrix factorization (2D image/video information is constructed using non-negative matrix for analysis [0041-0046]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 15**, *Yamano* (Figs. 8-15) method of driving an organic light emitting diode display (method applied to numerous types of displays including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the method comprising:

receiving image data for display (receives input image data for driving the display [0012,0204,0628,0633,0638]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix “correspond” to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line) wherein said image matrix comprises an m X n (row x column) matrix I (resultant matrix of time X signal line is an 8 X 1 driving matrix but is exemplary and as shown in Figs. 50-53 more signal lines than 1 would exists in an actual display) and said first and second factor matrices respectively comprise an m X p (row x column) matrix W (first

factor matrix of time X scan line is an 8 X 8 matrix for 8 scanning lines) and a p X n (row x column) matrix H (second factor matrix of signal line X scan line is an 8 X 1 matrix for 8 scanning lines by 1 signal line) and where I≈W.H (final image matrix I is approximately equal to first factor scanning matrix and second factor signal matrix).

Yamano does not explicitly disclose where p is less than or equal to the smallest of n and m in Figs. 8-15. However, this is because *Yamano* is only illustrating an example using one signal line for illustrative purposes. As indicated in Figs. 50-53, the intended display to be driven does in fact contain 8 or more signal lines which is greater than or equal to the time dimension of the above driving matrix.

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided a larger matrix to account for more signal lines in the display as taught by *Yamano* Figs. 50-53 in the matrix of *Yamano* Figs. 9-15. The suggestion/motivation would have been to account for more than one column line of data driving signals there by increasing the native resolution of the display.

As to **claim 23**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type

display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising;

an input for receiving image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500, 0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0502,0503]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

a system for factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15),said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

output means to output said row and column drive signals respectively defined by said first and second factor matrices (scanning and segment line

driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]), wherein all elements of said second factor matrix are equal to or greater than zero (second factor matrix corresponding to signal column driving values are equal to 1 in Fig. 15).

Yamano does not expressly disclose wherein all the elements of said first factor matrix are equal to or greater than zero.

Smaragdis discloses wherein all the elements of a first and second factor matrices are equal to or greater than zero (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 24**, *Yamano* discloses method of driving an organic light emitting diode display (method applied to numerous types of displays including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are

formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the method comprising:

receiving image data for display (receives input image data for driving the display [0012,0204,0628,0633,0638]; Further image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0502,0503]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

formatting said image data in said image matrix into a plurality of subframes (image data matrix is formatted to account for the number of subframes within one frame [0343,0536,0559] and the way it is applied is illustrated in Fig. 26), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel during 4 subframes of one frame [0343]; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven

simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]); and

driving said row and column electrodes with said subframe data (scanning and segment line drivers drive the lines of the display according to the subframe data in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]),

wherein said formatting comprises compressing said image data into said plurality of subframes (input image data is compressed into matrix form wherein each piece of subframe data is part of the desired image so that when the subframes are driven sequentially, their combination are seen as a compressed image [0343,0536,0559]; Figs. 8-15, 16, 26, 27, 31, 35, and 39-43).

Yamano does not expressly disclose wherein all driving data are only positive or zero data or wherein said compressing comprises non-negative matrix factorisation.

Smaragdis discloses wherein all data are only positive or zero data and wherein compressing to get the data involves non-negative matrix factorisation (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught

by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 34**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising:

an input to receive image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]) said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

a system for formatting said image data in said image matrix into a plurality of subframes (image data matrix created comprising driving data for multiple subframes [0343; Fig. 26] stored in display memory along using orthogonal function ROM for storing the processing matrices [0501,0802,0803];

Fig. 15), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (scanning and segment line drivers drive the lines of the display according to the subframe data in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]); and

an output to output said subframe data for driving said row and column electrodes (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]).

Yamano does not expressly disclose wherein all driving data are only positive or zero data.

Smaragdis discloses wherein all data are only positive or zero data (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 35**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types

including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising:

an input for receiving image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

an output to provide data for driving said row and column electrodes of said display (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]);

data memory to store said image data (memory for storing image data within the segment driver IC [0291,0628]);

program memory storing processor implementable instructions (memory 105 stores microcontroller instructions [0630,0632,0637] and ROM 113 stores matrices for processing [0501,0519,0802,0803]); and

a processor coupled to said input, to said output, to said data memory and to said program memory to load and implement said instructions (microcomputer is connected to the display drivers and transmits image data to the data memory and instructions to the program memory where the data memory is connected to the driver ICs which are connected to the output signal lines [0519,0628,0629,0651,0672,0723]), said instructions comprising instructions for controlling the processor to:

input said image data (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]);

factorise said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

output said row and column drive signals respectively defined by said first and second factor matrices (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]).

Yamano does not expressly disclose wherein all the elements of said first factor matrix are equal to or greater than zero.

Smaragdis discloses wherein all the elements of a first and second factor matrices are equal to or greater than zero (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 36**, *Yamano* discloses a driver (segment line and scanning ICs [0014,0265,0288]) for an emissive display (displays include numerous types including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the driver comprising:

an input to receive image data for display (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0502,0503]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data))

an output to provide data for driving said row and column electrodes of said display (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]);

data memory to store said image data (memory for storing image data within the segment driver IC [0291,0628]);

program memory storing processor implementable instructions (memory 105 stores microcontroller instructions [0630,0632,0637] and ROM 113 stores matrices for processing [0501,0519,0802,0803]); and

a processor coupled to said input, to said output, to said data memory and to said program memory to load and implement said instructions (microcomputer is connected to the display drivers and transmits image data to the data memory

and instructions to the program memory where the data memory is connected to the driver ICs which are connected to the output signal lines [0519,0628,0629,0651,0672,0723]), said instructions comprising instructions for controlling the processor to:

input said image data (image data is input from the image source to the display's picture controller and drivers [0440,0500,0502,0503]);

format said image data into a plurality of subframes (image data matrix is formatted to account for the number of subframes within one frame [0343,0536,0559] and the way it is applied is illustrated in Fig. 26), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel during 4 subframes of one frame [0343]; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]); and

output said subframe data for driving said row and column electrodes (scanning and segment line driver ICs output driving signals corresponding to the matrix of image driving data to corresponding columns and rows [0288,0289,0313,0328,0485]).

Yamano does not expressly disclose wherein all driving data are only positive or zero data.

Smaragdis discloses wherein all data are only positive or zero data (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

As to **claim 2**, *Yamano* discloses wherein said driving comprises driving a plurality of said row electrodes in combination with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel; Figs. 27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]).

As to **claim 3**, *Yamano* (Figs. 26, 27, 31, 35, 39-43) discloses wherein said driving comprises driving said display with successive sets of said row and column signals to build up a display image, each said set of signals defining a subframe of said display image, said subframes combining to define said display image (drives sets of rows and columns within each subframe in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]).

As to **claim 4**, *Yamano* discloses wherein a number of said subframes is no greater than the smaller of a number of said row electrodes and a number of said column electrodes (The number of subframes is 4 (Figs. 39-43) and according to Figs. 50-53, the number of display scan lines is greater than 18 and the number of signal lines is 8 however, this is an exemplary schematic and is in no way meant to be limiting).

As to **claim 5**, *Yamano* discloses wherein said number of subframes is less than the smaller of a number of said row electrodes and a number of said column electrodes (The number of subframes is 4 (Figs. 39-43) and according to Figs. 50-53, the number of display scan lines is greater than 18 and the number of signal lines is 8 however, this is an exemplary schematic and is in no way meant to be limiting).

As to **claim 6**, *Yamano* (Fig. 26) discloses wherein said first factor matrix has dimensions determined by a number of said row electrodes and a number of said subframes (a driving matrix will vary depending on the number of scan lines and subframes to be driven since the rows of a driving matrix correspond to each subframe of a frame and the columns correspond to each scanning line therefore depending on the number of subframes and scanning lines the display to be driven has, the size of the matrix will vary. This is further reflected in Figs. 8-15 where the scan matrix of 8 column values is for driving 8 scan lines [0299]), and wherein said second factor matrix has dimensions determined by a number of said column electrodes and said number of subframes (although shown in an

exemplary case of a driving matrix for 1 signal line (Figs. 9-15) where it is driven as shown Fig. 16 this is not meant to be limiting as the matrix will change as the number of lines change).

As to **claim 26**, *Yamano* discloses wherein said display comprises a multicolour display, wherein said image data comprises colour image data (red, green, and blue image data for driving a color display [0389,0420,0581,0585, 0778,0946]), and wherein said compressing comprises compressing data for a green colour channel of said display less than data for at least one of a red and a blue colour channel of said display (more bits are used for image data of green and red while blue is compressed to fewer bits [0585,0778]).

As to **claim 27**, *Yamano* discloses wherein said formatting is configured to generate subframe data (image data matrix is formatted comprising driving data for multiple subframes in one image frame [0343,0536,0559; Fig. 26] and the way it is applied is illustrated in Fig. 26 stored in display memory along using orthogonal function ROM for storing the processing matrices [0501,0802,0803]) such that data from more than one said subframe enables driving a pixel of said display (pixel image data of each frame is split into 4 subframes for driving [0343]; Figs. 27,31,35,39-43), whereby more than one said subframe contributes to an apparent brightness of pixels of the display (when driving displays using subframes, the sum of the subframe gradation values over one frame period drives the pixel for that frame and the amount of gradation/image data driven to

the pixel directly contributes to the resulting brightness of the displayed pixel since gradation data includes brightness information [0523, 0828]).

As to **claim 31**, *Yamano* discloses wherein said display comprises a passive matrix and organic light emitting diode display (applied to a simple matrix display [0013,0202,02640288,0289] of numerous types of displays including OLED [0201,0202]).

5. Claims 7, 22, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Yamano* (US 2004/0066363) in view of *Smaragdis* (US 2005/0021333) and *Routley* (GB 2389952).

As to **claim 7**, *Yamano* discloses a method of driving an organic light emitting diode display (method applied to numerous types of displays including OLED [0201,0202]), the display having a plurality of pixels each addressable by a row electrode and a column electrode (in the matrix type display, pixels are formed at the intersections of segment lines 206 and scan lines 205 as shown in Figs. 50-53 [0469-0473]), the method comprising:

receiving image data for display (receives input image data for driving the display [0012,0204,0628,0633,0638]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and

signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

driving said display row and column electrodes using said row and column drive signals respectively defined by said first and second factor matrices (display shown in Figs. 16, 26, 27, 31, 35, and 39-43 are being driven according to display matrices of Figs. 8-15).

Yamano does not expressly disclose wherein said factorising comprises non-negative matrix factorisation (NMF).

Smaragdis discloses factorizing image data using non-negative matrix factorization (2D image/video information is constructed using non-negative matrix for analysis [0041-0046]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught

by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

Yamano discloses configuring first and second factor matrices (image data factored into scan matrix (row) and column matrix (signal); Fig. 15) as well as driving respective of peak brightness [0600].

Yamano in view of *Smaragdis* does not expressly reducing a peak pixel brightness of said display compared with a row-by-row driving of said display using said image data.

Routley discloses wherein reducing a peak pixel brightness of a display compared with a row-by-row driving of a display using an image data (variable brightness in the display is achieved by adaptively controlling the supply voltage in accordance with displayed pixel brightness, where variable brightness is achieved by driving the display using variable substantially constant current generators [0070]. Furthermore, a row by row driving method which will not reduce the maximum brightness of the display based on a configuration of row and column matrices (Fig. 5) in which a pixellated passive matrix display is generally only driven a row at a time although appearing to provide a uniformed display to a human observer because of the rapidity of the row refresh. Thus the supply voltage may be reduced when this will not reduce the regulated current or pixel brightness of the pixel with the highest drive voltage in a particular row being driven [0032]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have reduced a peak brightness as taught by *Routley* in the driving of *Yamano* as modified by *Smaragdis*. The suggestion/motivation would have been to improve picture quality.

As to **claim 22**, *Yamano* discloses receiving image data (receives input image data for driving the display [0012,0204,0628,0633,0638]) for display by an organic light emitting display (displays include numerous types including OLED [0201,0202]), said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data));

factorising said image matrix into a product of at least a first factor matrix and a second factor matrix (image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix

defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line); and

driving said display row and column electrodes using said row and column drive signals respectively defined by said first and second factor matrices (display shown in Figs. 16, 26, 27, 31, 35, and 39-43 are being driven according to display matrices of Figs. 8-15).

Yamano does not expressly disclose wherein said factorising comprises non-negative matrix factorisation (NMF).

Smaragdis discloses factorizing image data using non-negative matrix factorization (2D image/video information is constructed using non-negative matrix for analysis [0041-0046]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

Yamano in view of *Smaragdis* does not expressly disclose a non-tranistory carrier medium carrying a processor control code.

Routley discloses a non-transitory carrier medium carrying a processor control code (storage medium carrying processor control code [page 14, lines 23-28]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided instructions on a carrier medium as

taught by *Routley* in the display driving of *Yamano* as modified by *Smaragdis*. The suggestion/motivation would have been to provide a greater consumer base as well as save money due to the decreased cost of manufacturing and distributing software.

As to **claim 33**, *Yamano* discloses receiving image data (receives input image data for driving the display [0012,0204,0628,0633,0638]) for display by an organic light emitting display (displays include numerous types including OLED [0201,0202]) said image data defining an image matrix (image data realized in a matrix of values; Figs. 8-15 [0503,0504]) in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display (both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data)):

formatting said image data into a plurality of subframes (image data matrix is formatted to account for the number of subframes within one frame [0343,0536,0559] and the way it is applied is illustrated in Fig. 26), each said subframe comprising data for driving a plurality of said row electrodes simultaneously with a plurality of said column electrodes (the plurality of scan lines are each driven in combination with the driving of the signal lines in order to display the data signal in the pixel during 4 subframes of one frame [0343]; Figs.

27,31,35,39-43. Further, multiple scan lines can be driven simultaneously using the multi-line selection MLS driving [0014,0202,0298,0313,0522]); and

driving said row and column electrodes with said subframe data (scanning and segment line drivers drive the lines of the display according to the subframe data in order to build up a display image by the end of the full frame since a frame is a sum of the subframes [0343,0536,0559]).

Yamano does not expressly disclose wherein all driving data are only positive or zero data or wherein said compressing comprises non-negative matrix factorisation.

Smaragdis discloses wherein all data are only positive or zero data and wherein compressing to get the data involves non-negative matrix factorisation (when using the factoring method of non-negative matrix factorization 2D image/video information is constructed using non-negative matrix for analysis [0041-0046] wherein a non-negative data matrix 151 is factored 160 to produce a first and second factor matrix which are also non-negative matrices [0025]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have used non-negative matrix factorization as taught by *Smaragdis* in the display of *Yamano*. The suggestion/motivation would have been to detect components of non-stationary signals [0002,0006-0008].

Yamano in view of *Smaragdis* does not expressly disclose a non-tranistory carrier medium carrying a processor control code.

Routley discloses a non-transitory carrier medium carrying a processor control code (storage medium carrying processor control code [page 14, lines 23-28]).

At the time of invention, it would have been obvious for a person of ordinary skill in the art to have provided instructions on a carrier medium as taught by *Routley* in the display driving of *Yamano* as modified by *Smaragdis*. The suggestion/motivation would have been to provide a greater consumer base as well as save money due to the decreased cost of manufacturing and distributing software.

Allowable Subject Matter

6. Claim 30 is allowed.

7. Claims 16-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. Applicant's arguments filed 5 February 2010 have been fully considered but they are not persuasive.

a. Applicant submitted that *Yamano* does not teach “the image data defining an image matrix in which rows and columns of the image matrix correspond to rows and columns of image pixels of the display". Examiner respectfully

disagrees. *Yamano* teaches a first matrix of image data scanXtime, a second matrix of image data signalXscan, and a resulting matrix of signalXtime. Therefore, both the second factor matrix and the resulting matrix "correspond" to rows and columns of image pixels of the display for at least the reasons that the second factor matrix includes image data for both scan and signal lines while the resulting matrix results from the multiplication of the first matrix (containing plural row data) and the second matrix (containing row and column data). Additionally, it was mentioned that the figures are in an exemplary case of a driving matrix for 1 signal line (Figs. 9-15) where it is driven as shown Fig. 16 this is not meant to be limiting as one of ordinary skill in the art would realize that the matrix will change as the number of desired lines change.

b. Applicant further submits that Yamano in view of Smaragdis does not disclose "factorising said image matrix into a product of at least a first factor matrix and a second factor matrix". Examiner respectfully disagrees. *Yamano* discloses image data factored into scan matrix (row) and column matrix (signal) using orthogonal function ROM for storing the processing matrices [0501,0802,0803]; Fig. 15), said first factor matrix defining row drive signals for said display (first matrix of time X scan line is a matrix of image information for 8 scan lines as shown in Fig. 15), said second factor matrix defining column drive signals for said display (second matrix of scan line X signal line is a matrix of signal line values for one signal line).

c. Applicant further submits that one of ordinary would not reasonably be led to look to *Yamano* because "the methods referred to in *Yamano* relate to LCD displays, but are unsuitable for OLED displays". Examiner respectfully disagrees. While the values used in the example matrices may specifically relate to an LCD as the Applicant submits, that does not detract from *Yamano* disclosing that these methods themselves are applicable to OLED and EL displays in which one skilled in the art would realize different values are relevant [0201-0202].

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT STONE whose telephone number is (571)270-5310. The examiner can normally be reached on Monday-Friday 9 A.M. - 4:30 P.M. E.S.T. (alternate Fridays off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chanh D. Nguyen can be reached on (571)272-7772. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert M Stone/
Examiner, Art Unit 2629

/CHANH NGUYEN/
Supervisory Patent Examiner, Art Unit 2629